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# **Science and Technology Perspectives**

## **DEVELOPMENTS**

### **Composite Materials Seminar**

(Japan/PRC) A seminar on composite materials will be held at Tokyo University on 6-7 July. The seminar will be sponsored by the Japan Composite Materials Academy and the Association for Reinforced Plastics. Advanced composite materials and aerospace specialists from the PRC will attend. (Tokyo KAGAKU KOGYO NIPPO 25 Feb 87) Junko A. X2726

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## **FEATURE ARTICLES**

### **JAPAN/PRC/TAIWAN: Superconductor Breakthroughs Surveyed ..... Page 5**

Over a four month period, researchers in Japan, the PRC, and Taiwan have announced a series of critical temperature breakthroughs in the use of metallic oxides as superconductors.

### **PRC: Modified "Long March" Launcher ..... Page 7**

Designed to compete in the commercial launch market, the Long March LM2/4L will be the PRC's largest and most powerful booster.

### **JAPAN: Semiconductor Production ..... Page 9**

Although most of Japan's semiconductor makers are reducing 256K DRAM production, 1M DRAM marketing practices could spark another crisis in US-Japan trade relations.

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# **SPECIAL FAR EAST ISSUE**

PERSPECTIVES selections are based solely on foreign press, books and journals, or radio and television broadcasts. Some of the materials used in this publication will appear as abstracts or translations in FBIS serial reports. Comments and queries regarding this publication may be directed to the Managing Editor (Craig M. ) or to individuals at the numbers listed with items.

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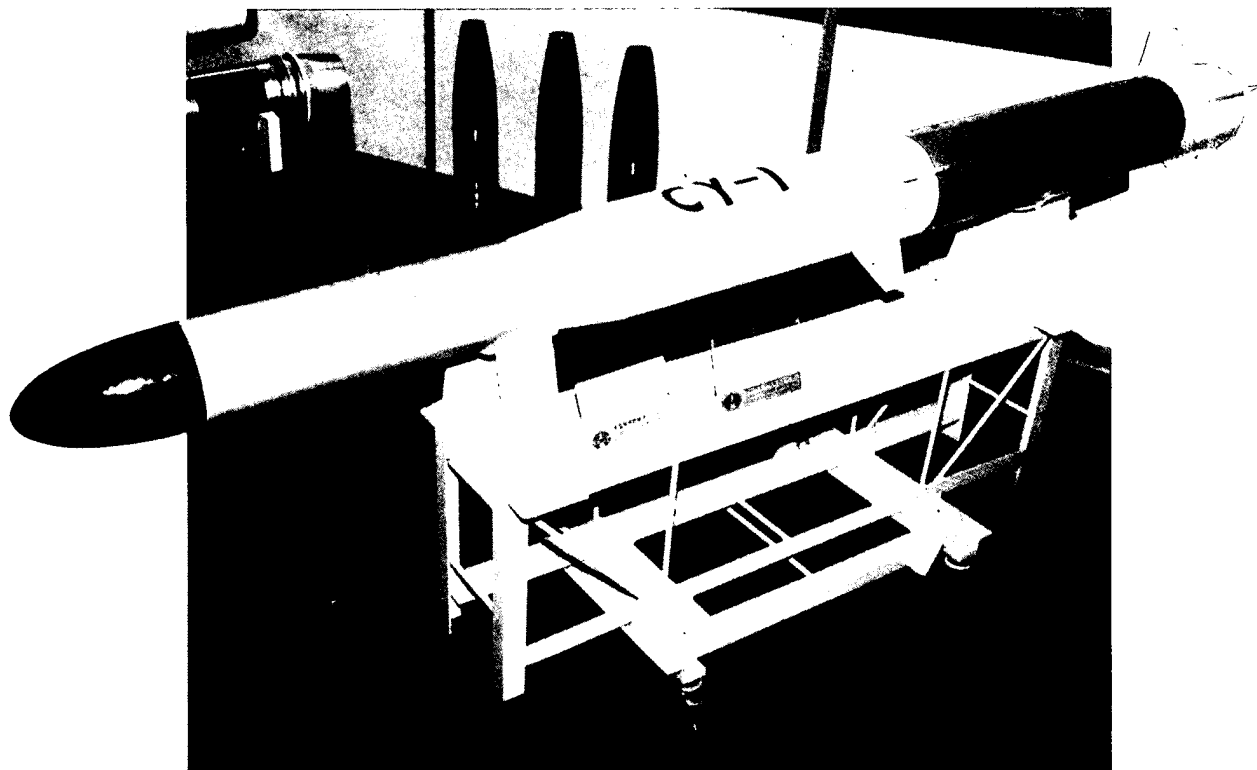
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### ***DEVELOPMENTS***

*DEVELOPMENTS highlight S&T events reported in the foreign media. Items followed by an asterisk will be published by FBIS. The contributor's name and telephone number are provided.*

#### **ASW Missile**

(PRC) The China Precision Machinery Import-Export Corporation (CPMIEC) has developed a single-stage solid propellant ballistic antisubmarine missile that is launched from a shipborne multiple launcher. Designated the CY-1, it is 5.5 meters long, weighs 700 kilograms (including torpedo), and utilizes an active/passive acoustic homing torpedo capable of attacking submarines traveling 33 knots at depths of 150 to 300 meters. The missile is shown below on display at the Asiandex Exhibition in Beijing. (Hong Kong CONMILIT No. 123, 1 Feb 87) Henry V. X2779



*The CY-1 Antisubmarine Missile*

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**FOR OFFICIAL USE ONLY****Biotechnology  
Data base**

(Japan/FRG) Japanese expenditures for biotechnology research (primarily in genetic engineering applications) are continuing to increase, according to a FRG Ministry for Research and Technology (BMFT)-sponsored study. The study also showed that Japanese successes are based largely on an extensive information network which enables researchers to keep abreast of all foreign experimental and industrial developments. The BMFT plans to copy this strategy by developing a database called BIJANCA (Biotechnology in Japan: National and Corporate Activities) to track biotechnology advances in Japan and other countries. BIJANCA, which will be run by the FRG Society for Biotechnological Research, will be operational in the fall. (Bonn TECHNOLOGIE NACHRICHTEN-MANAGEMENT INFORMATIONEN 26 Feb 87) Milan Unit/Eva L. X2519

**Factory Automation**

(Japan) The Ministry of International Trade and Industry (MITI) has launched the three-year Factory Automation Interconnection System (FAIS) project to design a standardized software package that will interconnect diverse factory automation systems. Although the system will be based on General Electric's Manufacturing Automation Protocol (MAP), FAIS reportedly will improve on MAP's poor cost effectiveness and be uniformly applicable to a variety of automation equipment. The system will also be designed in accordance with International Standard Organization (ISO) guidelines to enhance its marketability. Project R&D will be conducted by Japan's International Factory Automation Center (IROFA) with a budget of 1 to 2 billion yen. (Tokyo NIKKAN KOGYO SHIMBUN 10 Jan 87) Akiko S. X2726

**Metallurgy**

(Japan) A joint development team from Mitsubishi Heavy Industries and Nippon Steel Corporation has developed a high-strength stainless steel designated 316 MN (carbon 0.01 percent, nitride 0.07 percent) that has excellent ductility and can withstand 200,000 hours of continuous usage under temperatures as high as 600°C, a world record. This development represents a two to tenfold improvement over the performance of currently available stainless steel in creep rupture stretch, stress, and longevity. The firms predict that the use of this steel in power generating equipment will reduce manufacturing costs. The steel may also have applications in fast breeder reactors. (Tokyo NIKKAN KOGYO SHIMBUN 4 Feb 87) Junko A. X2726

**Microelectronics**

(Japan) NTT has developed a 20K CMOS associative memory chip (having the largest memory capacity to date) with 1.2 micron features and a 20 nanosecond read time. The chip is 5.3 x 7.9 millimeters and contains 287,000 transistors. Because associative memory retrieves data directly by contents rather than by storage location, it is faster than current general-purpose memory and is expected to be the main memory in next-generation, AI computers. NTT now aims to develop an associative processor which combines an associative memory and processor on a single silicon substrate. (Tokyo NIKKEI SANGYO SHIMBUN 21 Mar 87) Andy R. X2726

(Japan/PRC) A joint research agreement was signed on 12 January between the Japanese Science and Technology Agency's National Research Institute for Metals (NRIM) and the PRC's Iron and Steel Institute of Beijing to develop technology for extracting gallium from iron ore. An essential element in the electronics industry (GaAs semiconductors), gallium, at present, can

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only be recovered as a byproduct of aluminum refinement. Japanese scientists plan to test a newly developed vapor phase refining method (not further identified) to extract the metal. The agreement also calls for a five-year research program on gallium enrichment, chemical extraction, and the separation and refining of rare metals from oxides. (NIHON KEIZAI SHIMBUN 13 Jan 87; KAGAKU KOGYO NIPPO 13 Jan 87) Junko A. X2726

**Microwave Communications**

(PRC) The Second Artillery (China Strategic Rocket Force) Engineering Design Institute has developed a relatively inexpensive passive long-range microwave troposcatter digital communications system. Capable of document and encoded transmissions, it has extensive applications in the military, telecommunications, and mining sectors. A communications unit can be built for 30,000 yuan, reducing previous costs by several million yuan. (Beijing JIEFANGJUN BAO 21 Jan 87) Henry V. X2779

**New Materials**

(South Korea) Yun Han-sik and Son Tae-hwan of the Korea Advanced Institute of Science and Technology's Polymer Fiber Science Laboratory have developed a polymer alloy fiber called the "Dream Fiber," which has received a US patent. The fiber, which is produced by blending two kinds of crystalline polymer solutions (not further described), has applications in bullet proof vests, helmets, and other military equipment. According to Dr. Yun, the fiber's modulus of elasticity reaches 1,200 grams per denier, exceeding that of DuPont's Kevlar. (Seoul MAEIL KYONGJE SINMUN 19 Feb 87) Kay T. X2900

**Nuclear Plant Simulator**

(South Korea/France) Seoul has purchased a "full-scope" nuclear power plant simulator from the French firm Thomson. The simulator, which duplicates the entire operation of a nuclear facility, represents a "significant technology and know-how transfer," according to Thomson Simulator Division executive Jacques Roux. The simulator reportedly will be able to duplicate the most advanced functions being developed by the French firms Alstom and Framatome for Korea's latest nuclear power plant. Six Korean engineers are participating in the building of the simulator at Cergy-Pontoise. (For previous reporting on Korea's nuclear energy program, see PERSPECTIVES Vol. 2 No. 2, p 9.) (Paris L'USINE NOUVELLE 19 Feb 87) Eva L. X2519

**RPV Reconnaissance System**

(PRC) China has developed its first airborne color television transmission system for use in RPVs (remotely piloted vehicle). Ground controllers can use the system to observe nuclear blasts and to guide an RPV into the blast zone for sample collection. The system can also be used in military reconnaissance, public security operations, and emergency rescue. (Nanjing XINHUA RIBAO 28 Jan 87) Henry V. X2779

**Space Cooperation**

(Japan/Sweden/PRC) Sweden's Esrange Space Center in Kiruna will receive data from Japan's recently launched Marine Observation Satellite (MOS 1), according to an agreement signed between the two countries. The MOS 1's polar orbit places the satellite in view of Kiruna up to six times a day. The Esrange Center will transmit the satellite's data to Japan via Toulouse, France. Japan and the PRC have expressed strong interest in pursuing space collaboration with Sweden. (Stockholm NY TEKNIK 12 Mar 87) Elli M. X2519

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**Tank R&D**

(Japan) Mitsubishi Heavy Industries has begun R&D work on a next-generation main battle tank (as yet undesignated) that will be smaller and more maneuverable than a current Mitsubishi-designed model being readied for deployment in 1990. In addition to reactive armor, the tank will have armor plating made of multilayered composites consisting of speciality steel and ceramics. For night vision, the tank will be equipped with a thermal imaging device. Ishikawajima-Harima Heavy Industries is doing R&D work (not further detailed) on a gas turbine engine that would give the tank improved acceleration over the 1990 model and a top speed of 70 kilometers per hour, equivalent to that of the 1990 model. (Tokyo NIKKEI SANGYO SHIMBUN 23 Feb 87) Mitchy E. X2726

**Tech Transfer**

(Japan/USSR) The Soviets are reportedly using a Toshiba turnkey machine tool plant (sold to Moscow in the early 1980s) to produce submarine propellers whose design radically reduces detection. The plant, which is equipped with computer-controlled systems and advanced metal lathes, was intended for the manufacture of precision parts for high-speed digging and drilling equipment. The matter is under COCOM investigation. (Oslo AFTENPOSTEN 25 Mar 87; Oslo ARBEIDERBLADET 24 Mar 87; Stockholm Domestic Service 21 Mar 87; Frankfurt/Main FINANCIAL TIMES 24 Mar 87) Elli M. X2519

**FOR OFFICIAL USE ONLY****JAPAN/PRC/TAIWAN:  
SUPERCONDUCTOR BREAKTHROUGHS SURVEYED**

*Key Points: Research in Japan, the PRC, and Taiwan paralleling that in the US has led to a succession of breakthroughs in raising the temperature at which certain metallic oxides become superconductors. Over a four-month period, critical temperatures have risen from 37°K recorded last December to a reported 123°K in March, according to press coverage from the three countries.*

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Laboratory success with superconductive materials could lead to dramatic developments in such areas as microelectronics, electrical power transmission, transportation systems, and subatomic physics research. The intensive research effort in superconductivity has generated fierce competition among scientists and extensive publicity for those credited with the latest breakthroughs. Japanese Government ministries and agencies have initiated several joint research projects that have brought together industrial firms, government organizations, and academic institutions such as NTT, NEC, Hitachi, Mitsubishi Electric, Toshiba Electric, the Electrotechnology Research Institute, and Tokyo University. Competition for research funding, however, has reportedly led to friction between the Ministry of International Trade and Industry's Agency of Science and Technology and the Ministry of Education. Breakthroughs by PRC scientists have received front-page coverage in the Beijing press, while the scientists themselves have been invited to meet with top government officials.

The following four-month chronology surveys temperature advances for superconductive materials as reported by the Japanese, PRC, and Taiwan media.

*December 1986-January 1987:* In late December, PRC scientists at the Chinese Academy of Sciences' Institute of Physics announce a metallic compound composed of barium, lanthanum, copper, oxygen, and other elements (not further identified) that became superconductive at 70°K (see PERSPECTIVES Vol. 2 No. 3, p 2). Tokyo University also announces in December that superconductivity has been achieved at 37°K using a ceramic oxide of lanthanum, strontium, and copper while researchers at Tohoku University and the Okazaki National Research Institute for Molecular Science achieve superconductivity with the same compound. The Agency of Science and Technology's Electrotechnical Laboratory reports in January that it had achieved superconductivity at 46°K using this ceramic oxide (see PERSPECTIVES Vol. 2 No. 4, cover).

*24 February:* The PRC's Institute of Physics announces a barium, yttrium, copper oxide superconductor with a critical temperature of 92.8°K and near-zero resistance at 78.5°K.

*2 March:* Taiwan scientists announce a yttrium, barium, copper oxide superconductor with a critical temperature of 75°K. On the same day, Japan's Research Institute for Metals at the Agency of Science and Technology announces a critical temperature of 100°K using a yttrium, barium, copper oxide ceramic. The Tokyo press also reports speculation that Japanese scientists might achieve superconductivity at 150°K to 300°K using a plasmon mechanism to produce electron pairs.

*3 March:* Japan's Research Institute for Metals reports superconductivity at 123°K and the production of superconductive wire composed of a lanthanum, strontium, copper oxide ceramic with a critical temperature of 35°K and a current of 1,000 amps per square centimeter in a 10-tesla magnetic field.

*4 March:* Beijing University and the Beijing Modern Physics Center announce a yttrium, barium, copper oxide superconductor with a critical temperature of 100°K.

*9 March:* The Chinese University of Science and Technology at Hefei reports a barium, yttrium, copper oxide superconductor with a critical temperature of 110°K and a linear deviation of 130°K.

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*12 March:* A Tokyo University team presents data that for the first time defines the crystal structure of a new yttrium, barium, copper oxide ceramic which becomes superconductive at 100°K. When fired at a high temperature, the ceramic revealed a bipolar structure of three parts yttrium and barium, two parts copper, and seven parts oxygen. The team found that when yttrium is used, oxygen molecules combine to form an octagonal, double-layered structure surrounding the yttrium-barium core.

*13 March:* Beijing University researchers use liquid nitrogen in magnetic levitation tests. Reporters are allowed to observe technicians insert liquid nitrogen into a test tube containing a small strip of a superconducting material (not further identified). When a magnet is placed near the test tube, the superconductor "mysteriously" rises about 1 centimeter.

*14 March:* Taiwan's Qinghua University and the Central Research Academy report a barium, yttrium, copper oxide superconductor with a critical temperature of 93°K and near-zero resistance at 88°K.

*18 March:* Researchers at the University of Tokyo's Engineering Department announce erbium, holmium, dysprosium, thulium, and lutetium as superconducting elements. Each element can replace yttrium in combination with barium, copper, and oxygen and the material becomes superconductive at 94°K.

*19 March:* The Chinese University of Science and Technology in Hefei announces a new barium, yttrium, copper oxide superconductor with a critical temperature of 93°K, a linear deviation of 215°K, and near-zero resistance at 91°K. The press reports that the 50-member team expects to achieve a 300°K critical temperature "in the future."

*24 March:* Beijing's Institute of Physics announces the development of a thin film (0.5 to 1 microns in thickness) with a critical temperature of 89.5°K. The film appears similar to that announced by Stanford University researchers on 13 March.

Joe A. X2085/Junko A. X2726



**FOR OFFICIAL USE ONLY****PRC: MODIFIED "LONG MARCH" LAUNCHER**

*Key Points: Slated for service in 1990, the Long March LM2/4L will be the PRC's largest and most powerful launcher. The rocket, which will be capable of launching a three-metric-ton satellite into geostationary orbit, is compatible with US upper stage engines and is specifically intended to attract foreign customers, according to AIR & COSMOS of 28 March.*

**Design**

The Chinese are designing a modified Long March equipped with four liquid propellant (UDMH-N<sub>2</sub>O<sub>4</sub>) boosters (each measuring 1.65 meters in diameter and capable of producing 71 metric tons of thrust) that will augment the rocket's four engines. Designated the Long March LM2/4L, the rocket will develop a liftoff thrust of 568 metric tons, twice that of the LM3 and LM4 versions (see table below). The LM2/4L, which will supersede the previously announced LM3/4L, is 46.5 meters tall and 3.35 meters in diameter. The rocket is designed is to be compatible with US upper stages (the AMS, apogee and maneuver stage; the PAM, payload assist module; the SCOTS, shuttle compatible orbital transfer subsystem; and the HPPM, higher performance propulsion module).

**Comparison of Long March Launch Vehicles**

Vehicle	LM2C	LM3	LM4	LM2/4L
Date in Service	1974	1984	1987	1990
Configuration	2 stages	3 stages	3 stages (new 3rd)	2 stages and 4 boosters
Propellants	N <sub>2</sub> O <sub>4</sub> , UDMH	N <sub>2</sub> O <sub>4</sub> , UDMH, cryogenics	N <sub>2</sub> O <sub>4</sub> , UDMH, cryogenics	N <sub>2</sub> O <sub>4</sub> , UDMH
Height	32.6 m	43.25 m	about 43 m	46.5 m
Weight	191 t	202 t	about 200 t	428 t
Thrust	284 t	284 t	284 t	568 t
Payload				
Low Earth Orbit (200 km)	2.5 t	NA	NA	9 t
Geostationary Transfer Orbit (elliptical; 200 km perigee, 35,800 km, apogee)	1.7 t	1.4 t	2 t	NA
Geostationary Orbit (35,900 km)	NA	NA	NA	1.6 to 3 t

The new design allows the Long March to put a 3-metric-ton payload into geostationary orbit. The modified rocket also incorporates a larger payload shroud (4.1 meters in diameter) than earlier Long March versions, enabling the LM2/4L to accommodate satellites up to a width of 3.92 meters in diameter.

**Launches**

The improved capabilities of the Long March are aimed specifically at attracting foreign customers, according to a top official of the China Great Wall Industry Corporation (CGWIC), which handles foreign launch orders. The PRC hopes to compete with France and Japan in the launch of foreign commercial satellites and claims that the CGWIC can provide launch services at a price 10 to 15 percent below that charged by Arianespace. The PRC has already sold launches to the US firms Teresat and the American Pacific Satellite Corporation for 1988 on the LM3.

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Anticipating increased foreign launch orders with the LM2/4L, the Chinese have renovated and expanded the Xichang launch facility and have built a second launch site at Jiuquan. These facilities reportedly will provide a 10 to 12 launch per year capability, although only three to four launches a year are currently planned.

Testing, launch, and mission control activities for the rocket are managed by the Chinese Satellite Launch, Telemetry, Tracking, and Control Center in Xi'an.

Eva L. X2519

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**JAPAN: SEMICONDUCTOR PRODUCTION**

*Key Points: At the direction of the Ministry of International Trade and Industry (MITI), most major Japanese semiconductor manufacturers appear to be reducing their production of 256K DRAM (dynamic random access memory) chips in compliance with the US-Japan Semiconductor Agreement. However, anticipated increases in the production of 1M DRAMs may cause more friction with the US, according to March reports in NIHON KEIZAI SHIMBUN.*

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In compliance with the US-Japan Semiconductor Agreement, MITI has been directing chip makers to reduce their production of 256K DRAMs to prevent a price fall. Hitachi and most other major makers have followed MITI's guidelines and reduced production of the chip since last summer.

Hitachi has announced that it will further reduce production of 256K DRAMs to 4 million per month starting in April. The company had already cut back production from 9 million per month last summer to its present 5.4 million figure. Hitachi will instead produce more thyristors (bistable devices with three or more junctions that include silicon controlled rectifiers, gate-control switches, and multilayer two-terminal devices), 1M DRAMs, and EPROM (erasable programmable read only memory) chips. Hitachi's Texas plant will make microcomputers and gate arrays instead of DRAMs.

NEC Corporation is the only major maker that has not followed MITI's guidelines and has maintained production of 256K DRAMs at the 10 million per month level. After conducting its own market survey, NEC announced that as of March it would reduce its monthly production to 9 million chips including semi-assembled chip bases. NEC also has decided to increase its FY87 semiconductor-related capital investment by 10 percent over the previous year's 50 billion yen. NEC anticipates that the US computer industry will grow at a rate of 13 percent in 1987 instead of the minus 2 percent in 1986. The Japanese audio-visual industry, another major market, should have a single-digit negative growth rate in 1987 instead of the minus 14 percent rate of 1986.

Chip makers hope to compensate for decreased 256K DRAM production with increased production of 1M DRAMs and manufacturers are already vying for 1M DRAM customers. The price of 1M DRAMs has been fluctuating downward from the 2,400 yen mark at yearend. The lowest fair market value (FMV) of this chip for US export is \$18 (2,800 yen at an exchange rate of 155 yen to the dollar), and the gap between the FMV and the domestic price is likely to widen.

MITI is reportedly concerned about the 1M DRAM price trend and has warned manufacturers not to repeat the marketing practices that led to the 256K DRAM crisis. Nevertheless, the Tokyo press anticipates continued friction with the US over the semiconductor issue.

Yukiko I. X2900

**FOR OFFICIAL USE ONLY****REPORTS**

*REPORTS surveys science and technology trends as detailed in articles, books, and journals. It also includes summaries and listings of articles and books which may serve as potential sources for future research. Conference proceedings will occasionally be presented in this section.*

**JAPAN: NEW MATERIALS TECHNOLOGY****ALLOY DESIGN THEORY**

Two professors at Japan's Toyohashi Science and Technology College have developed the "Electronic Alloy Design Theory" that has resulted in a process for fabricating new high-performance alloys for use in advanced technological applications such as aerospace materials, super conductive magnets, and nuclear fusion reactors, according to NIHON KEIZAI SHIMBUN of 27 January.

In developing the theory, Natsuo Yukawa and Masahiko Morinaga applied the "molecular orbital calculation method" (used to describe the properties of surfaces or catalysts) to metals. This method allows precise computer calculation of the effects of different kinds and amounts of metals on new alloys. Using this method, the scientists recently developed the "TUT alloy," a new high-strength, super heat- and corrosion-resistant nickel alloy which is superior to the alloy currently used in the engines of Boeing 767 aircraft.

In cooperation with Hyogo Teachers College, the Toyohashi team is currently applying the process to the development of titanium alloys for nuclear fusion reactors and chemical plants. Further applications are expected in the areas of intermetallic compounds and ceramics.

**CERAMIC BONDING**

Sumitomo Electric Industries has developed a new method of bonding ceramics and metals, according to NIKKAN KOGYO SHIMBUN and NIHON KEIZAI SHIMBUN of 5 March.

The bond is created by heating composite alloy layers placed between layers of steel and thin film multilayered metallized silicon nitride. The resulting ceramic compound reportedly can support a maximum weight of 52 kilograms per square millimeter of bonded surface, a world record. The new process will make the bonding of ceramics and metallic materials less costly and thus expand the scope of ceramic applications in the manufacture of more complex shaped products such as gas turbines, auto engine parts, and corrosion-resistant processing tools.

Since 1984, Sumitomo has been conducting research sponsored by MITI's Agency of Industrial Science and Technology specifically on silicon nitride bonding technology as part of the agency's Next-Generation Project. Sumitomo used an "ion plating technique" (not further identified) developed for the Next-Generation Project to prepare the silicon nitride used in the research.

**NEW SEMICONDUCTOR MONOCRYSTAL**

The Science and Technology Agency's Inorganic Materials Research Institute has created a cubic boron nitride (cBN) monocrystal with a maximum width of 3 millimeters and maximum thickness of 1 millimeter, the largest monocrystal of its kind to date, according to KAGAKU KOGYU NIPPO of 25 February. Because it exhibits dynamic electric properties equivalent to those of diamonds, researchers

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expect this monocrystal to have direct application as a semiconductor. The cBN monocrystal is the product of 30 hours of exposure to 55 kilobars (kb) of pressure at an estimated temperature of 1,700°C. The cBN particles were melted in a lithium calcium boron nitride solvent that contained cBN crystals in a molybdenum dish, allowing the melted particles to accumulate gradually on the cBN crystal. This man-made substance is stable under high pressure and semi-stable under standard atmospheric pressure. The largest monocrystals previously produced were on the order of 0.5 millimeters in width, too small for an evaluation of its properties.

Junko A. X2723

**JAPAN: TOSHIBA INDUSTRIAL ROBOT**

Toshiba has developed a prototype robot (as yet undesignated) for use in hazardous environments such as nuclear and conventional power plants in which it would perform inspection and maintenance functions.

The robot is capable of semiautonomous movement by means of an ultrasonic sensor that allows it to recognize and compute the contours of solid objects. Its maneuverability is further enhanced by a lightweight aluminum alloy body and a three-wheel configuration whose assembly incorporates components that are 40 percent smaller and 50 percent lighter than those used in other Japanese-designed robots. The robot is capable of ascending and descending stairs 15 centimeters in height and 30 degrees in slope. More intricate maneuvers are controlled by an operator who monitors three-dimensional images transmitted by a color camera mounted on the robot's frame.

The robot is equipped with a manipulator that has nine degrees of freedom, a force sensor for tactile sensitivity (needed in such procedures as bolt tightening), and what is reported to be the world's smallest charge-coupled device (CCD) camera. Commands for the manipulator, force sensor, and CCD camera are transmitted through a unified control system containing a 16 bit central processing unit.

Akiko S. X2726

**JAPAN: REVISED NUCLEAR POWER POLICY**

The Long-Term Policy for Nuclear Power Development and Utilization recently drawn up by Japan's Atomic Energy Commission (an advisory body to the prime minister) revises several objectives established in 1982 in the aftermath of an international oil shortage, according to March reports in NIHON KEIZAI SHIMBUN.

The amended policy recommends that nuclear power development be slowed because of reduced domestic energy demand resulting from conservation technology. The revised plan reduces nuclear power production planned for the year 2000 from 90 million kilowatts to 53 million kilowatts and advises postponing (for financial and technical reasons not further described) by 10 years the commercial use of fast breeder reactors (FBRs) originally slated to go into operation between 2020 and 2030.

The commission has shifted the emphasis of Japan's nuclear energy planning away from the FBR to improving existing light-water reactor (LWR) technology and plant safety features. The commission recognizes the need to research uranium enrichment methods that integrate laser technology, innovate new materials for use in nuclear facilities, develop new radioactive waste treatment procedures, and concentrate additional efforts in the design, operation, and management of nuclear power plants. In addition, the commission recommends studies on the effects of radiation-induced cell and genetic damage and that the results of these studies be applied to research in the treatment of nuclear accident victims.

Implementation of this policy, designed to serve as guidance for the Japan Atomic Energy Research Institute, the Power and Reactor Nuclear Fuel Development Company, and other organizations, will cost an estimated 7 trillion yen over the next decade.

Mitchy E. X2726

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**PRC: INFORMATION THEORY/CRYPTOGRAPHY**

A special issue of the PRC journal ACTA ELECTRONICA SINICA (Vol 14, No 4) dated July 1986 presents 14 papers on Chinese research in information theory, with particular emphasis on cryptography.

**Contributors**

Several papers on cryptography and source coding were prepared by the PRC's Northwest Telecommunication Engineering Institute. Established in 1952, the institute consists of six departments (information engineering, electronic engineering, computers, electromechanics, applied physics, and electromagnetic engineering) that specialize in fields such as information theory and processing, communications systems design, remote sensing, and microwave technology. According to 1980 figures, the institute had a faculty of 866 and a student body of over 3,800.

The issue also contains papers contributed by Nankai University (Tianjin), the South China Institute of Technology (Guangzhou), and the Institute of Systems Science, CAS (Beijing). Foreign contributions to the journal included papers from Osaka University (Japan) and Linkoping University (Sweden).

**Topics**

The papers are divided into four categories:

- Cryptography: Five papers on public-key cryptosystems, linear feedback shift register with nonlinear combination logic, and aspects of sequences on Galois fields.
- Channel and Channel Coding: Four papers on Reed-Solomon encoders and decoders, varying channel and jamming problems, inversionless iterative algorithm for multisequence shift register synthesis, and fast-soft decision decoding.
- Shannon Theory: Four papers on Shannon information theory, estimation and rate distortion theory, and fast-soft decision decoding algorithms for generalized threshold Chase and decision error trap decoding.
- Source Coding: One paper on the design method for an optimal vector compandor with least mean square error criterion.

(A translation of the journal's table of contents and selected abstracts appear in CHINA REPORT: SCIENCE AND TECHNOLOGY, 11 Feb 87.)

Joan H. X2726/Mark Z. X9572

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***PREVIEWS***

*PREVIEWS is an annotated list of selected science and technology items being published by FBIS. The list may also contain previously published items of wide consumer interest.*

**CHINA REPORT**

**EXTRACTION THEORY, SEPARATION TECHNOLOGY FOR RARE EARTHS**

Article details breakthroughs in rare earth extraction and separation research being conducted by Beijing University and the Chinese Academy of Sciences. (Beijing KEJI RIBAO 27 Feb 87)

**ELECTRONICS INDUSTRY ASSESSED**

Article evaluates current status of PRC's electronics industry, the transfer of laboratory research to industry, and the prospect for joint ventures with foreign firms. (Tokyo NIKKEI ELECTRONICS No. 412, 12 Jan 87)

**JAPAN REPORT: SCIENCE AND TECHNOLOGY**

**AVENUES FOR JAPANESE PARTICIPATION IN SDI RESEARCH**

Article describes ways in which Japanese companies can participate in SDI-related research and their likely strategies for doing so. A table lists the names of companies which could contribute to SDI research in acquisition and tracking, directed energy weapons, kinetic energy weapons, and other key technologies. (Tokyo SHUKAN DAIYAMONDO 13 Dec 86)

**FABRICATION TECHNOLOGY FOR 16M DRAM BEING DEVELOPED**

Series of articles describes KrF excimer lasers, high-resolution photoresists, and additional technologies being developed by Japanese companies to fabricate ICs with 0.5-micron features. (Tokyo NIKKEI MICRODEVICES Feb 87)

**REACTIONS TO CANCELED FUJITSU-FAIRCHILD DEAL**

Seven articles detail Japanese perceptions of the events that led to Fujitsu's retracting its offer to purchase Fairchild. The consequences of the aborted deal on Fujitsu's semiconductor strategy and on Japanese investment in the US are also discussed. (Tokyo NIHON KEIZAI SHIMBUN 17-19 Mar)

**COMPUTER COMPANY STRATEGY FOR THE 1990s**

Articles describe the plans of Japan's six largest computer manufacturers to increase their sales of computer hardware and software. (Tokyo NIKKEI COMPUTER 13 Oct 86)

**EUROPE/LATIN AMERICA REPORT: SCIENCE AND TECHNOLOGY**

**SWEDEN PROVIDES PRC WITH FACTORY AUTOMATION EQUIPMENT**

Article examines Swedish General Electric Corporation (ASEA) sale of motors, transformers, and control systems for use in PRC factory automation projects. ASEA factory planning, equipment installation, and technical training activities are also discussed. (Sundbyberg DATORNYTT 11 Mar 87)

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**FRG: TOSHIBA MEGACHIP PROJECT IN BRAUNSCHWEIG**

Article details Toshiba's increased 1M DRAM production (from 100,000 to 1 million per month) at its Braunschweig plant and notes Toshiba contacts with the University of Braunschweig. (Rijswijk PT/AKTUEEL 11 Feb 87)

**FRG-JAPAN JOINT MARKETING VENTURE**

Article discusses joint venture company established by the FRG's Heraeus Holding Company and the Japanese firm Abe Denzai to facilitate distribution in Japan of Heraeus electronics, semiconductor, and optical telecommunications products. (Duesseldorf HANDELSBLATT 20-21 Mar 87)



